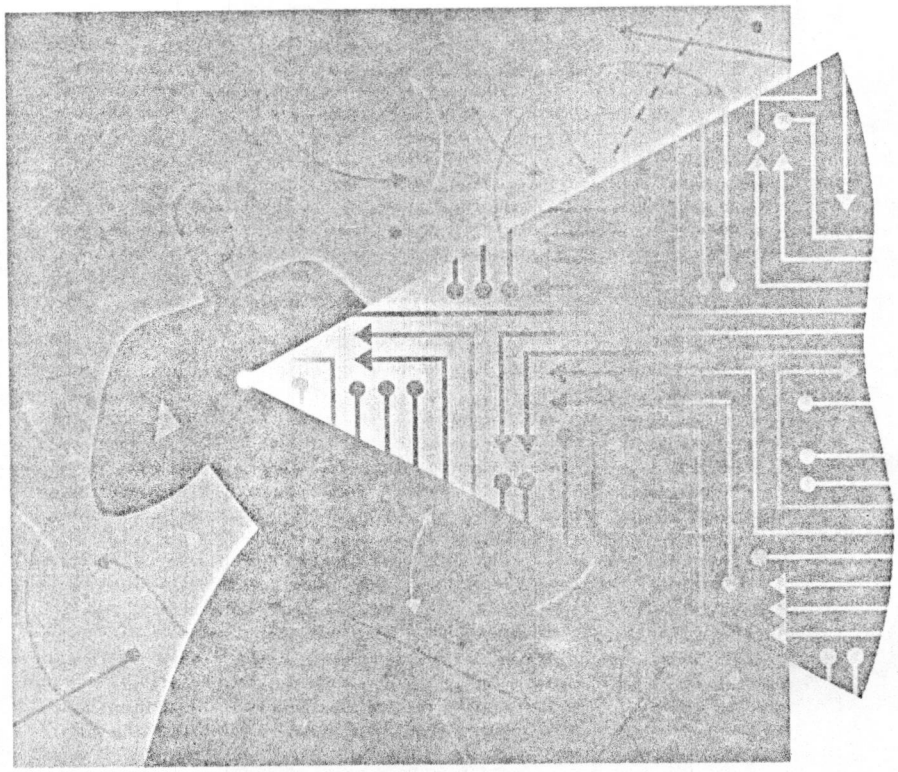
Meridian 1

NT5D12AA Dual DTI/PRI Card

Product description and installation



NORTEL MERIDIAN

Meridian 1

NT5D12 Dual-port DTI/PRI Card

Product description and installation

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Contents

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About this guide

This guide is intended to serve as a supplemental document, to be retired after the contents contained herein have been integrated into the Generic X11 standard documentation. This guide contains a product description of the NT5D12 Dual-port DTI/PRI (DDP) card and the NTBK51AA Downloadable D-Channel daughterboard (DDCH), and explains how to install the NT5D12 and NTBK51AA on supported systems, namely Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems (the NT5D12 is not supported on the Option 11E.)

Installation procedures for the associated hardware, such as Clock Controllers, D-Channel Handlers (DCHs), and ISDN Signaling Link (ISL) hardware, are not contained in this document; this information may be found in the standard installation document (553-2901-200). Procedures on how to configure a system once the hardware has been installed may be found in the standard product description and administration document (553-2901-100.)

Applicability of this guide

The intended audience of this guide is all craftspersons charged with the installation and administration of a T1 and/or ISDN PRI system.

How this guide is organized

This guide has been logically arranged in the following sections:

— **Product Description** - provides a functional description of the NT5D12 DDP and NTBK51AA DDCH;

— **Installation Procedures** - describes the procedures required to install, replace or remove the NT5D12 DDP card, and the NTBK51AA DDCH.

Product description

NT5D12 Dual-port DTI/PRI (DDP) card overview

The NT5D12 is a dual-port 1.5 DTI/PRI card (the DDP firmware functions in DTI or PRI mode) integrating the functionality of two QPC472 DTI/QPC720 PRI cards and one QPC414 ENET into one card. The NT5D12 occupies a single Network shelf slot and provides two DTI/PRI network connections, an optional connection to an external D-Channel Handler, the QPC757 D-Channel Handler Interface (DCHI) or NT6D80 Multi-purpose Serial Data Link (MSDL), and an optional plug-on NTBK51AA Downloadable D-Channel daughterboard (DDCH.)

The NT5D12 DDP card supports all features (except the echo canceller and protocol conversion) of the QPC720. In addition, it maintains the backward compatibility of QPC720.

The NT5D12 DDP card hardware design uses a B57 ASIC E1/T1 framer. The carrier specifications comply with the ANSI TI.403 specification. The NT5D12 provides an interface to the 1.5 Mbps external digital line either directly or through an office repeater, Line Terminating Unit (LTU), or Channel Service Unit (CSU).

Supported software releases

Table 1 shows the Generic X11 software releases that are supported on the NT5D12.

Table 1 - Supported software releases on the NT5D12

Software Release	Trunk Type & Signalling					
	DTI/Dual Pulse		DTI/DTMF	PRI/DCHI	PRI/MSDL	PRI/DDCH
	Out.	Inc.				
Release 17	Yes	Yes	Yes	Yes	No	No
Release 18/19	Yes	Yes	Yes	Yes	Yes	Yes
Release 20/21	Yes	Yes	Yes	Yes	Yes	Yes

Legend:

Yes - Supported Release of Software.

No - Not supported Release of Software

Note: The MSDL and NTBK51AA DDCH are compatible with Generic X11 Release 18 and later software.

NTBK51AA daughterboard

The optional dual-port Downloadable D-Channel daughterboard (DDCH, NTBK51AA) has been introduced to be used with the NT5D12 DDP in system hardware configurations as an alternative to an MSDL or a DCHI card (refer to "Hardware required for DDP configuration" on page 18 for possible configurations.)

The NTBK51AA DDCH daughterboard is a two-port D-Channel Handler card supporting all the features of the existing four port MSDL (NT6D80). It eliminates the need for a D-Channel Handler or an MSDL card, and associated cables.

> ***Note:*** Only one version, the NTBK51AA, can be used in DDP cards. The newer NTBK51BA version has only 30+30 pin connectors (instead of 40+30 pins in the AA version). The missing 10 pins in the BA version prohibits usage of port 0 on the DDP card.

The NTBK51AA can support a maximum of 32 (16*2) D-Channels per system (the MSDL can support a maximum of 64.)

> ***Note 1:*** The software allocation for NTBK51AA DDCH is similar to the MSDL. It is both physical and logical, and supports D-Channel functionality only.
>
> ***Note 2:*** Port 0 has to be an even loop on the DDP, and Port 1 has to be an odd loop. Port 2 and Port 3 should not be configured.

The connection between the DDP card and the DDCH daughterboard is made using two headers: one 30 pin and one 40 pin connector.

The NTBK51AA DDCH card consists of the following:

— 16 MHz MC68EC020 microprocessor;

— MC68901 Multi-function Peripheral Controller;

— Z16C35 Integrated Serial Communication Controller;

— One Mbyte of main memory;

— 512 KBytes of Flash EPROM.

The main functions of the card are:

— Dual-port Serial Communication Controller message handling with DMA for support of 2 D-channels;

— Sanity check and Self Tests;

— Program download from the Meridian 1 CPU;

— Serial maintenance port (for debugging purposes).

D-Channel and MSDL interface

The connection between the DDP card and the DCHI or MSDL is via a 26 pin female D type connector. The data signals conform to the electrical characteristics of the EIA standard RS-422.

Two control signals are used to communicate the D-Channel link status to the DCHI or MSDL. These are:

- Receiver Ready (RR), originating at the DDP card, to indicate to the DCHI or MSDL that the D-channel link is operational.
- Transmitter Ready (TR), originating at the DCHI or MSDL, to indicate to the DDP card that the DCHI or MSDL are ready to use the D-Channel link.

Table 2 indicates how the RR control signal operates with regard to the DDP status.

Table 2 - DCHI/MSDL Receiver Ready control signals

RR State	Condition
ON	D-Channel data rate selected at 64 Kbps or 56 Kbps or 64 Kbps inverted *and* PRI loop is enabled *and* PRI link is not in RED alarm mode state *and* PRI link is not transmitting a yellow alarm pattern *and* PRI link is not receiving a Remote Alarm Indication from the remote facility *and* PRI link is not in FA3 mode *and* Transmitter Ready (TR) control signal from the DCHI/MSDL is ON
OFF	All other conditions

DDP faceplate

Figure 1 and Figure 2 illustrate the faceplate layout for the DDP card. The faceplate contains an enable/disable switch; a DDCH status LED; 6 x 2 trunk port status LEDs; and six external connectors. Table 3 shows the name of each connector, its designation with respect to the faceplate and the name and description of the card it is connected to. Also shown are the names of the LEDs.

Figure 1 - NT5D12 faceplate - general view

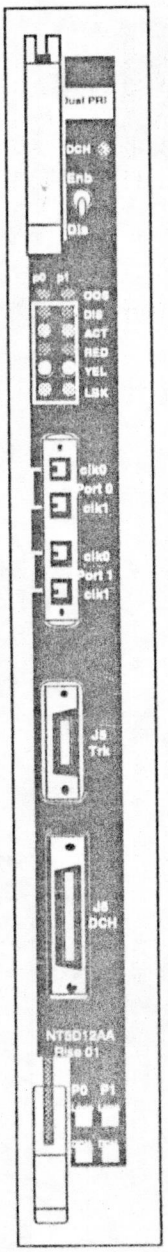


Figure 2 - DDP faceplate - detailed view

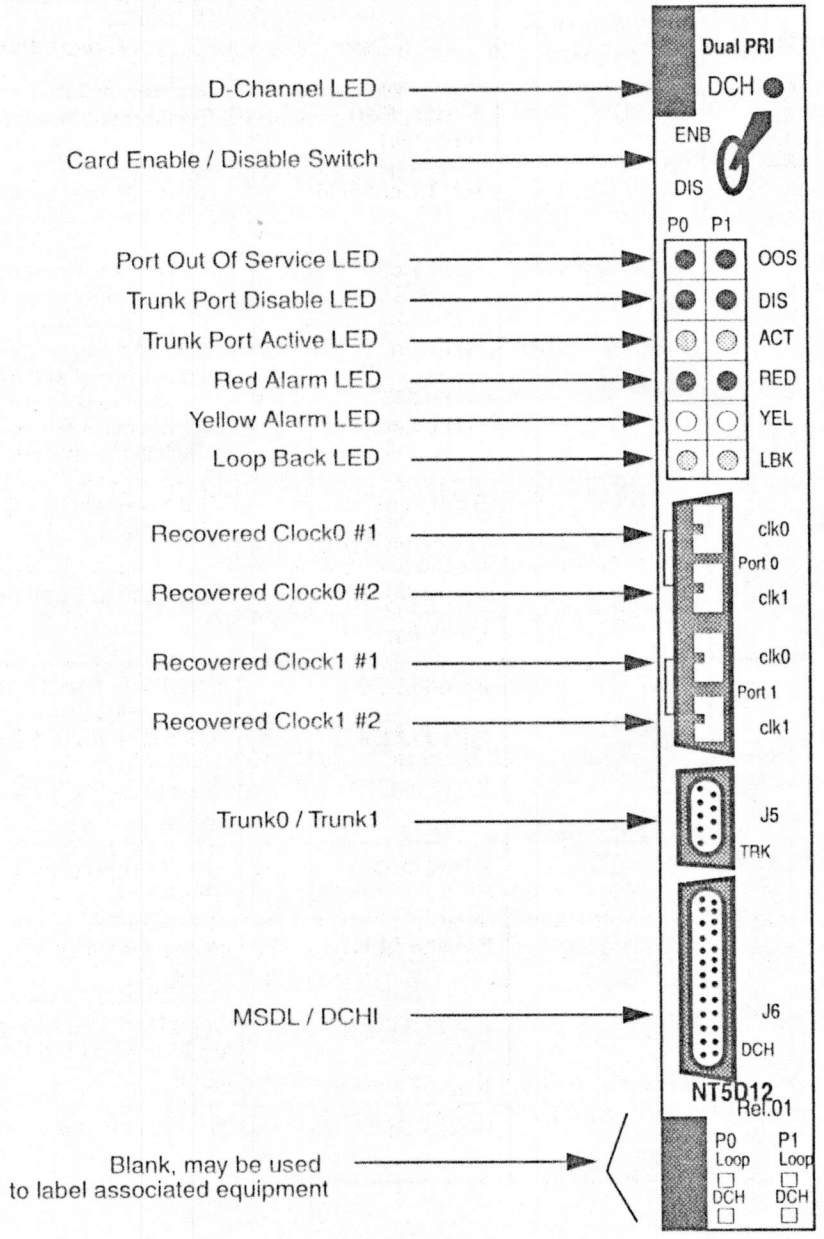


Table 3 - External connectors and LEDs

Function	Faceplate Designator	Type	Description
Switch	ENB/DIS	Plastic, ESD protected	Card Enable/disable switch
Connectors	Port 0 Clock 0	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 0 Clock 1	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 1 Clock 0	RJ11 Connector	Connects reference clock to Clock Controller card
	Port 1 Clock 1	RJ11 Connector	Connects reference clock to Clock Controller card
	J5 TRK	9 Pin Female D Connector	Two external DS-1 Trunk 0 and Trunk 1
	J6 DCH	26 Pin Female D Connector	Connects to DCHI or MSDL
LEDs	OOS	2 Red LEDs	ENET 0 or ENET 1 disabled
	DIS	2 Red LEDs	Trunk 0 or Trunk 1 disabled
	ACT	2 Green LEDs	Trunk 0 or Trunk 1 lines active
	RED	2 Red LEDs	Red Alarm on Trunk 0 or Trunk 1
	YEL	2 Yellow LEDs	Yellow Alarm on Trunk 0 or Trunk 1
	LBK	2 Green LEDs	Loop Back test being performed on Trunk 0 or Trunk 1
	DCH	Bicolor Red/Green LED	NTBK51AA status

The following is a brief description of each element on the faceplate:

Enable/Disable Switch

This switch is used to disable the card prior to insertion or removal from the network shelf; while this switch is in disable position the card will not respond to Meridian-1 CPU.

Port Out of Service LEDs

Two red LEDs which indicate if the "ENET0" and "ENET1" portion of the card are disabled. These LEDs are lit in the following cases:

- When the enable/disable switch is in state *disable* (lit by hardware).
- After power-up, before the card is enabled.
- When the ENET port on the card is disabled by software.

Trunk Port Disable LEDs

Two red LEDs which indicate if the "trunk port 0" and "trunk port 1" portion of the card are disabled. These LEDs are turned on in the following cases:

- When the enable/disable switch is in state *disable* (lit by hardware).
- After power-up, before the card is enabled.
- When digital trunk interface on the card is deactivated by software.

ACT LEDs

Two green LEDs which indicate if the "trunk port 0" and "trunk port 1" portion of the card is active.

RED LEDs

Two red LEDs which indicate if the near end detects absence of incoming signal or loss of synchronization in "trunk port 0" or "trunk port 1" respectively. The Near End Alarm causes a Far End Alarm signal to be transmitted to the far end.

YEL LEDs

Two yellow LEDs which indicate if Far End Alarm has been reported by the far end (usually in response to a Near End Alarm condition at the far end) on "trunk port 0" or "trunk port 1".

LBK LEDs

Two green LEDs which indicate if remote loopback test is being performed on trunk port 0 or trunk port 1. The loopback indication is active when the digital trunk is in remote loopback mode (T1 signals received from the far end are regenerated and transmitted to the far end.) Normal call processing is inhibited during remote loopback test.

DCH LED

Dual color red/green LED which indicates that the on-board DDCH is present but disabled (red), or is present and enabled (green). If a DDCH is not configured on the DDP card, this lamp will not be lit.

Port 0 Clk Connectors

Two RJ11 connectors for connecting:

— Digital trunk port 0 recovered clock to primary or secondary reference source on clock controller card 0.

— Digital trunk port 0 recovered clock to primary or secondary reference source on clock controller card 1.

Port 1 Clk Connectors

Two RJ11 connectors for connecting:

— Digital trunk port 1 recovered clock to primary or secondary reference source on clock controller card 0.

— Digital trunk port 1 recovered clock to primary or secondary reference source on clock controller card 1.

Connector J5 (TRK)

A 9 pin D-Type connector used to connect:

— Digital trunk port 0 receive and transmit Tip / Ring pairs.

— Digital trunk port 1 receive and transmit Tip / Ring pairs.

Connector J6 (DCH)

A 26 pin D-type connector, used to connect the DDP card to MSDL or QPC757 external D-channel handlers.

System capacity and performance

Physical capacity

Each DDP card occupies one slot on the network shelf. It supports two digital trunk circuits and two network loops. The total number of DDP cards per system is limited by the number of network loops, physical capacity of the shelf, number of DTI/PRI interfaces allowed by the software and the range of DCH addresses.

D-Channel capacity

The software configuration for the NTBK51AA DDCH is similar to the MSDL. It is both physical and logical, and supports D-Channel functionality only.

Meridian 1 has a total capacity of 16 addresses (Device Addresses or DNUM) that may be reserved for DCHI card, MSDL card or DDCH card. One exception is DNUM 0 which is commonly assigned to the System Monitor.

No two different D-Channel providers can share the same DNUM. Hence, the combined maximum number of DCHI, MSDL and DDCH cards in the system is 16.

The DCHI and DDCH have two D-Channel units, the MSDL has four. Therefore the total number of D-Channel in a Meridian 1 is derived by the following formula:

Total_Num_DCH-Units = Num_DCHIx2 + Num_DDCHx2 + Num_MSDLx4

Therefore, Total_Num_DCH-Units in any given system is between 0-63.

CPU capacity

Using a NT512 DDP card instead of DTI/PRI cards does not increase the load on the Meridian 1 CPU. The DDP replaces an ENET card and two DTI/PRI cards, it emulates the ENET card and the overall CPU capacity is not impacted by usage of DDP card instead of a DTI/PRI card.

Power requirements

Table 4 lists the power requirements for the DDP card.

Table 4 - DDP power requirements

Voltage	Source	Current	
		DDP (without NTBK51AA)	DDP (with NTBK51AA)
+5V	Backplane	3A	3.8A
+12V	Backplane	25mA	75mA
-12V	Backplane	25mA	75mA
Total Power (Maximum)		15.6W	20.8W

Testability and diagnostics

The DDP card supports all current QPC720 testing and maintenance functions through the following procedures:

- Selftest upon power up or reset;
- Signalling test performed in the OVL 30;
- Loopback tests, self tests, and continuity tests performed by OVL 60 and OVL 45;
- The D-Channel (MSDL, DCHI, DDCH) maintenance is supported by OVL 96.

Hardware required for DDP configuration

The following hardware is required when configuring the NT5D12 DDP on Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

Note: The NT5D12 DDP card hardware design uses a B57 ASIC E1/T1 framer. The carrier specifications comply with the ANSI TI.403 specification. The NT5D12 provides an interface to the 1.5 Mbps external digital line either directly or through an office repeater, Line Terminating Unit (LTU), or Channel Service Unit (CSU).

DTI/PRI

— one NT5D12 DDP

D-Channel Interface

Either of the following:

Note: Either the DCHI card, the MSDL, or the DDP card may be installed first. However, DDP loops must be configured in software before defining DCH links.

— one NT6D80 MSDL

or optionally, as a plug-on

— one NTBK51AA Downloadable D-Channel daughterboard

or optionally, an external DCHI card

— one QPC757 DCHI

Clock Controller

— QPC471/QPC775 Clock Controller(s)

Other hardware

Additional hardware may also required for PRI capability and applications. Installation instructions are given in other Northern Telecom publications or supplied by the manufacturer. This additional hardware may include:

- one Channel Service Unit (CSU) or Line Terminating Unit (LTU) per T1 span
- one Meridian Communications Unit (MCU) or Meridian Communications Adapter (MCA) per D-Channel port
- one office repeater per T1 span
- one QMT21C (or later vintage) High Speed Data Module (HSDM) per D-Channel port

Cabling

Cabling requirements are described in detail in the section that follows.

Cabling requirements

This section lists the types of cable used and the lengths required for internal and external NT5D12 DDP connections.

Note 1: No additional cabling is required for nB+D configurations. Multiple DDPs and the D-channel are associated through software in Overlay 17.

Note 2: A detailed discussion of each type of DDP cable listed below will follow.

New DDP cable assemblies include:

— Meridian 1 Trunk Tip/Ring Cables

- NT5D16AA
- NT5D17AA
- QCAD133

— DDP to QPC471/QPC775 Clock Controller Cables

- NTCG03AA
- NTCG03AB
- NTCG03AC
- NTCG03AD

— DDP to DCHI cables

- NTCK46AA
- NTCK46AB
- NTCK46AC
- NTCK46AD

— DDP to MSDL cables

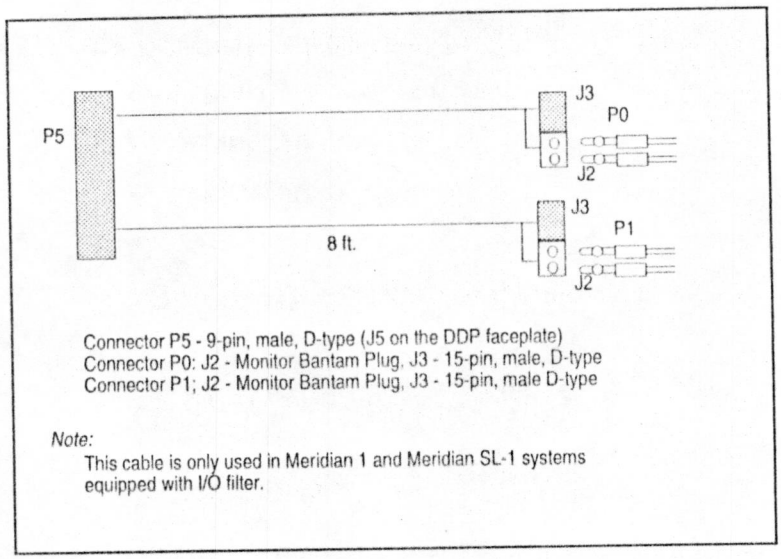
- NTCK80AA
- NTCK80AB
- NTCK80AC
- NTCK80AD

Trunk Tip/Ring cables

NT5D16AA

The NT5D16AA (8 ft) is a 100Ω cable for Meridian 1 and Meridian SL-1 systems equipped with an I/O filter panel, connecting the 9 pin D-type TRK port on the DDP faceplate to the I/O filter.

Note: On the I/O panel side, this cable is equipped with a monitor bantam plug and a 15 pin D-ty[e trunk connector mounted on a small PCB. There are no bantam plugs on the DDP faceplate.



Connector P5 - 9-pin, male, D-type (J5 on the DDP faceplate)
Connector P0: J2 - Monitor Bantam Plug, J3 - 15-pin, male, D-type
Connector P1; J2 - Monitor Bantam Plug, J3 - 15-pin, male D-type

Note:
This cable is only used in Meridian 1 and Meridian SL-1 systems equipped with I/O filter.

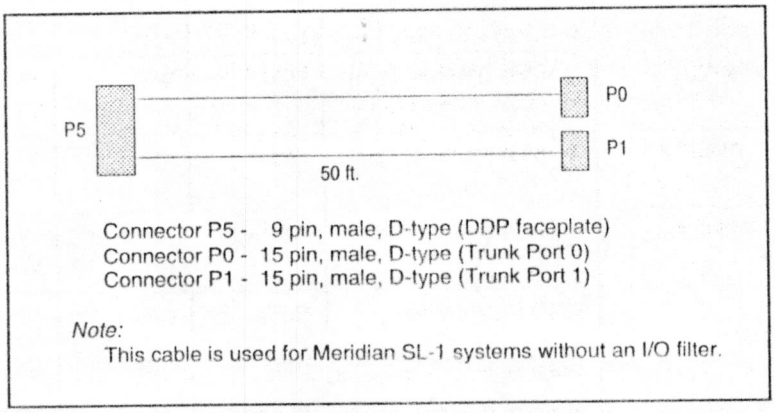
Table 5 which follows lists the pin attributes for the NT5D16AA cable.

Table 5- **NT5D16AA cable pins**

Cable	Name	Description	Color	DDP pins (J5)	I/O Panel pins (J2, J3)
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	J5-1	P0J3-1 P0J2-3
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	J5-2	P0J3-9 P0J2-9
0	T-PRI0RX	Trunk 0 Receive Tip	Black	J5-3	P0J3-3 P0J2-4
0	R-PRI0RX	Trunk 0 Receive Ring	White	J5-4	P0J3-11 P0J2-10
0		GND Shield Wire	Bare	N/C	Case P0
0		GND Shield Wire	Bare	N/C	Case P0
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	J5-5	P1J3-1 P1J2-3
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	J5-6	P1J3-9 P1J2-9
1	T-PRI1RX	Trunk 1 Receive Tip	Black	J5-7	P1J3-3 P1J2-4
1	R-PRI1RX	Trunk 1 Receive Ring	White	J5-8	P1J3-11 P1J2-10
1		GND Shield Wire	Bare	N/C	Case P1
1		GND Shield Wire	Bare	N/C	Case P1

NT5D17AA

The NT5D17AA (50 ft) is a 100Ω cable for Meridian SL-1 systems not equipped with an I/O filter panel, connecting the 9 pin D-type TRK port on the DDP faceplate directly to the Network Channel Terminating Equipment (NCTE).



Connector P5 - 9 pin, male, D-type (DDP faceplate)
Connector P0 - 15 pin, male, D-type (Trunk Port 0)
Connector P1 - 15 pin, male, D-type (Trunk Port 1)

Note:
This cable is used for Meridian SL-1 systems without an I/O filter.

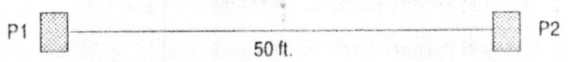
Table 6 which follows lists the pin attributes for the NT5D17AA cable.

Table 6- NT5D17AA cable pins

Cable	Name	Description	Color	DDP pins (J5)	NCTE pins (J3)
0	T-PRI0TX	Trunk 0 Transmit Tip	Black	J5-1	P01-1
0	R-PRI0TX	Trunk 0 Transmit Ring	Red	J5-2	P0-9
0	T-PRI0RX	Trunk 0 Receive Tip	Black	J5-3	P0-3
0	R-PRI0RX	Trunk 0 Receive Ring	White	J5-4	P0-11
0		GND Shield Wire	Bare	N/C	Case P0
0		GND Shield Wire	Bare	N/C	Case P0
1	T-PRI1TX	Trunk 1 Transmit Tip	Black	J5-5	P1-1
1	R-PRI1TX	Trunk 1 Transmit Ring	Red	J5-6	P1-9
1	T-PRI1RX	Trunk 1 Receive Tip	Black	J5-7	P1-3
1	R-PRI1RX	Trunk 1 Receive Ring	White	J5-8	P1-11
1		GND Shield Wire	Bare	N/C	Case P1
1		GND Shield Wire	Bare	N/C	Case P1

QCAD133

The QCAD133 (50 ft) is used for Meridian SL-1 systems equipped with an I/O filter panel, connecting the 15 pin I/O filter connector to the 15 pin NCTE connector.

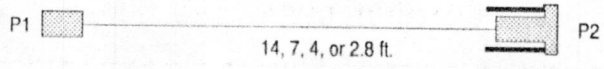


Connector P1 - 15 pin, female, subminiature D with jack-screws.
Connector P2 - 15 pin, male, subminiature D with slide-latch/ spring-latch (Opt.)

Note:
This cable is only used for Meridian SL-1 systems with an I/O filter.

Reference clock cables

The NTCG03AA (14 ft), NTCG03AB (2.8 ft.), NTCG03AC (4.0 ft.), or NTCG03AD (7 ft.) is a DDP card to Clock Controller cable, connecting each of the CLK0 or CLK1 ports on the DDP faceplate to the primary or secondary source ports on Clock Controller card 0 or 1.



Connector P1 - 4 pin, male, RJ11 (DDP faceplate)
Connector P2 - 9 pin, male, D-type (Clock Controller)

Note:
Includes an RJ11<-->9 pin D-type adaptor.

MSDL/DCHI cables

External DCHI cable

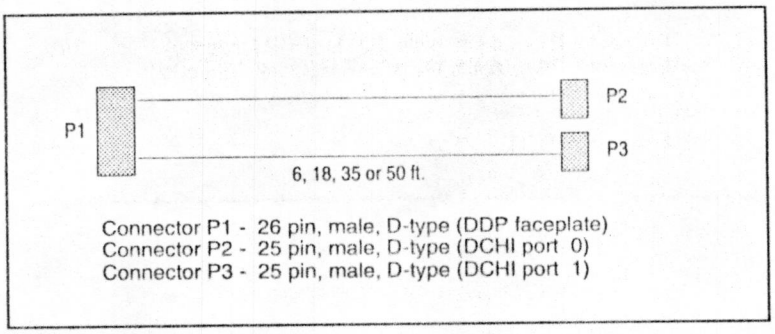
The NTCK46 cable connects the DDP card to the QPC757 DCHI D-Channel Handler card. The cable is available in four different sizes:

— NTCK46AA (6 ft) - DDP to DCHI cable

— NTCK46AB (18 ft) - DDP to DCHI cable

— NTCK46AC (35 ft) - DDP to DCHI cable

— NTCK46AD (50 ft) - DDP to DCHI cable



External MSDL cable

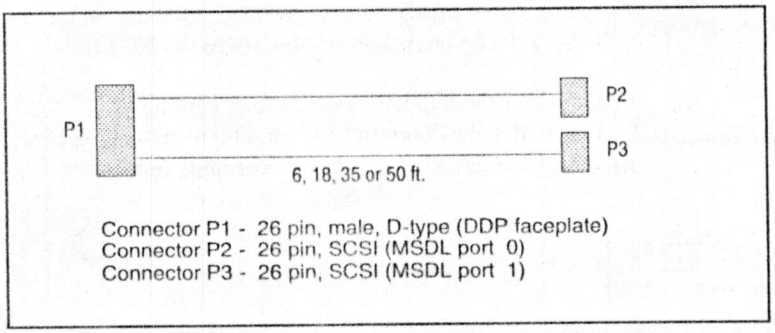
The NTCK80 cable connects the DDP card to the NT6D80 MSDL card. The cable is available in four different sizes:

— NTCK80AA (6 ft) - DDP to MSDL cable

— NTCK80AB (18 ft) - DDP to MSDL cable

— NTCK80AC (35 ft) - DDP to MSDL cable

— NTCK80AD (50 ft) - DDP to MSDL cable



Cabling diagrams

Figure 3 and Figure 4 provide examples of typical cabling configurations for the DDP. Please note that these figures are representational only, and are not intended to show the relational card slot position of the various cards.

Figure 3 shows a typical DDP cabling for a Meridian 1 system Option with an I/O panel, with the connection between the I/O panel and a Network Channel Terminating Equipment (NCTE).

Figure 4 shows cabling for a Meridian SL-1 system without an I/O panel. Here, the DDP faceplate is cabled directly to the NCTE.

> ***Note:*** Since there exists several clock cabling options, none has been represented in the diagrams. Please refer to "Clocking configurations" on page 36 for a description on each available option.

Figure 3 - DDP cabling for Meridian 1 and Meridian SL-1 systems with an I/O panel

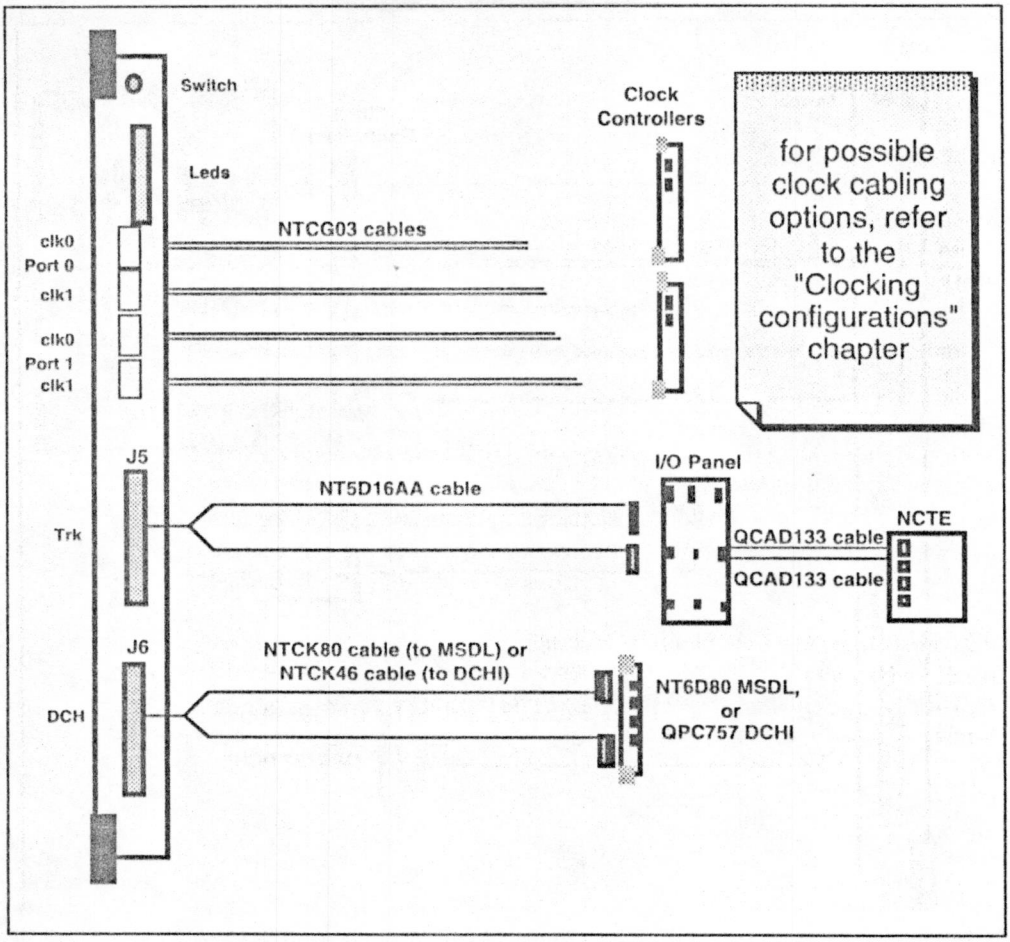
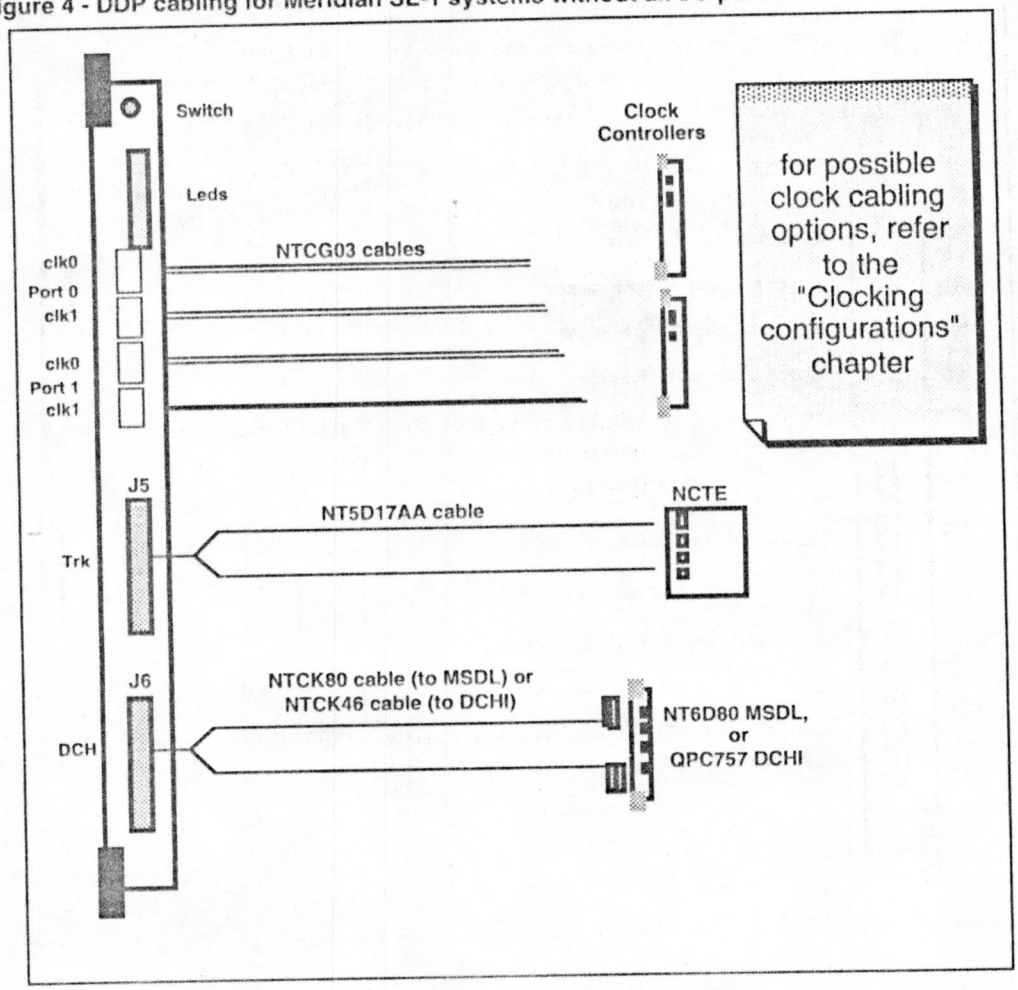


Figure 4 - DDP cabling for Meridian SL-1 systems without an I/O panel



Clocking

Clock operation

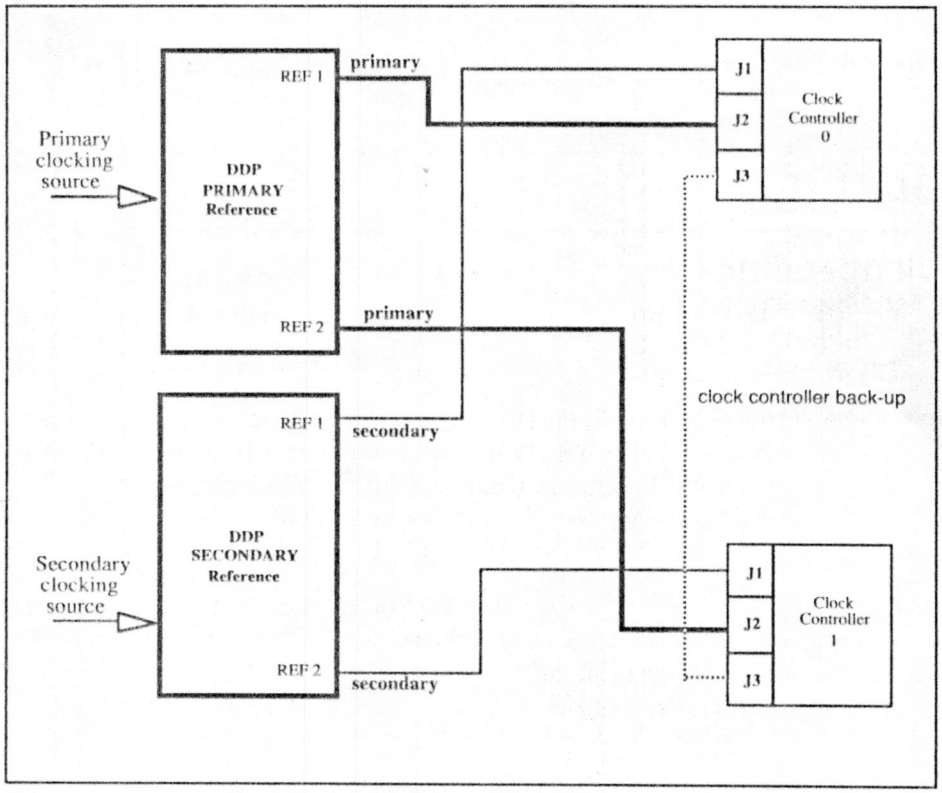
There are two types of clock operation - tracking mode and free-run mode.

Tracking mode

In tracking mode, the DDP loop supplies an external clock reference to a clock controller. Two DDP loops can operate in tracking mode, with one defined as the primary reference source for clock synchronization, the other defined as the secondary reference source. The secondary reference acts as a back-up to the primary reference.

As shown in Figure 5, a Meridian 1 or Meridian SL-1 system with dual CPUs may have two clock controllers (CC-0 and CC-1). One clock controller acts as a back-up to the other. The clock controllers should be completely locked to the reference clock.

Figure 5 - Clock Controller primary and secondary tracking



Free run (non-tracking) mode

The clock synchronization of the Meridian 1 or Meridian SL-1 may operate in free-run mode if:

- no loop is defined as the primary or secondary clock reference,
- the primary and secondary references are disabled, or
- the primary and secondary references are in local (near end) alarm

Reference clock errors

Meridian 1 software checks at intervals of 1 to 15 minutes to see if a clock controller or reference-clock error has occurred. (The interval of this check can be configured in Overlay 73.)

In tracking mode, at any one time, there is one active clock controller which is tracking on one reference clock. If a clock controller error is detected, the Meridian 1 or Meridian SL-1 system switches to the back-up clock controller, without affecting which reference clock is being tracked.

A reference-clock error occurs when there is a problem with the clock driver or with the reference clock at the far end. If the clock controller detects a reference-clock error, the reference clocks are switched.

Automatic clock recovery

A command for automatic clock recovery can be selected in Overlay 60 with the command EREF.

A DDP loop is disabled when it enters a local-alarm condition. If the local alarm is cleared, the loop is enabled automatically. When the loop is enabled, clock tracking is restored in the following conditions:

— If the loop is assigned as the primary reference clock but the clock controller is tracking on the secondary reference or in free-run mode, it is restored to tracking on primary.

— If the loop is assigned as the secondary reference clock but the clock controller is in free-run mode, it is restored to tracking on secondary.

— If the clock check indicates the switch is in free-run mode:

- Tracking is restored to the primary reference clock if defined.
- If the primary reference is disabled or in local alarm, tracking is restored to the secondary reference clock if defined.

Note: If the Meridian 1 or Meridian SL-1 was put into free-run mode intentionally by the craftsperson, it will resume tracking on a reference clock unless the clock-switching option has been disabled (LD 60, command MREF), or the reference clock has been "undefined" in the database.

Automatic clock switching

If the EREF command is selected in Overlay 60, tracking on the primary or secondary reference clock is automatically switched in the following manner:

— If software is unable to track on the assigned primary reference clock, it switches to the secondary reference clock and sends appropriate DTC maintenance messages.

— If software is unable to track on the assigned secondary reference clock, it switches to free run.

Clocking configurations

Clock Controllers may be used in a single CPU system or a dual CPU system.

A single CPU system has one Clock Controller card. This card can receive references clocks from two sources referred to as the primary and secondary sources. These two sources can originate from a PRI, DTI, etc. PRI cards such as the QPC720 are capable of supplying two references of the same clock source. These are known as Ref1 (available at J1) and Ref2 (available at J2) on the QPC720.

The NT5D12 card is capable of supplying two references from each clock source, i.e., four references in total. NT5D12 can thus supply Clk0 and Clk1 from Port 0 and Clk0 and Clk1 from Port 1. Either Port 0 or Port 1 can originate primary source, as shown in Figure 6 through Figure 9.

There is one new Clock Controller cable required for the new DDP card, which is available in four sizes; this is the NTCG03AA/AB/AC/AD. Refer to "Reference clock cables" on page 27 for more information.

Table 7 summarizes the clocking options. Table 8 explains the options in more detail.

Table 7 - Clock Controller options- summary

CC Option	CPU Type	Notes
Option 1	Single	Ref from P0 on Clk0 Ref from P1 on Clk0
Option 2	Dual	Ref from P0 on Clk0 Ref from P0 on Clk1
Option 3	Dual	Ref from P1 on Clk0 Ref from P1 on Clk1
Option 4	Dual	Ref from P0 on Clk0 Ref from P0 on Clk1 Ref from P1 on Clk0 Ref from P1 on Clk1

Table 8 - Clock Controller options - description

Clock Option	Notes
Option 1	This option provides a single CPU system with 2 clock sources derived from the 2 ports of the DDP. Connector Clk0 provides a clock source from Port 0. Connector Clk0 provides a clock source from Port 1. Refer to Figure 6 "- Clock Controller - Option 1"
Option 2	This option provides a Dual CPU system with 2 references of a clock source derived from port 0 of the DDP. Connector Clk0 provides a Ref 1 clock source from Port 0. Connector Clk1 provides a Ref 2 clock source from Port 0. Refer to Figure 7 "- Clock Controller - Option 2"
Option 3	This option provides a Dual CPU system with 2 references of a clock source derived from port 1 of the DDP. Connector Clk0 provides a Ref 1 clock source from Port 1. Connector Clk1 provides a Ref 2 clock source from Port 1. Refer to Figure 8 "- Clock Controller - Option 3"
Option 4	This option provides a Dual CPU system with 2 references from each clock source derived from the DDP. Connector Clk0 provides a Ref 1 clock source from Port 0. Connector Clk1 provides a Ref 2 clock source from Port 0. Connector Clk0 provides a Ref 1 clock source from Port 1. Connector Clk1 provides a Ref 2 clock source from Port 1. Refer to Figure 9 "- Clock Controller - Option 4"

Figure 6 - Clock Controller - Option 1

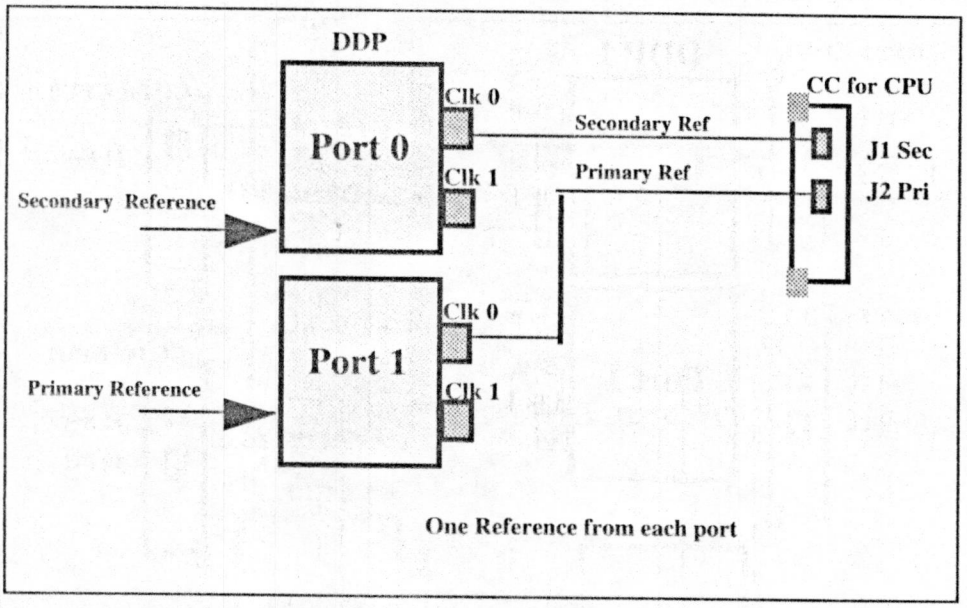


Figure 7 - Clock Controller - Option 2

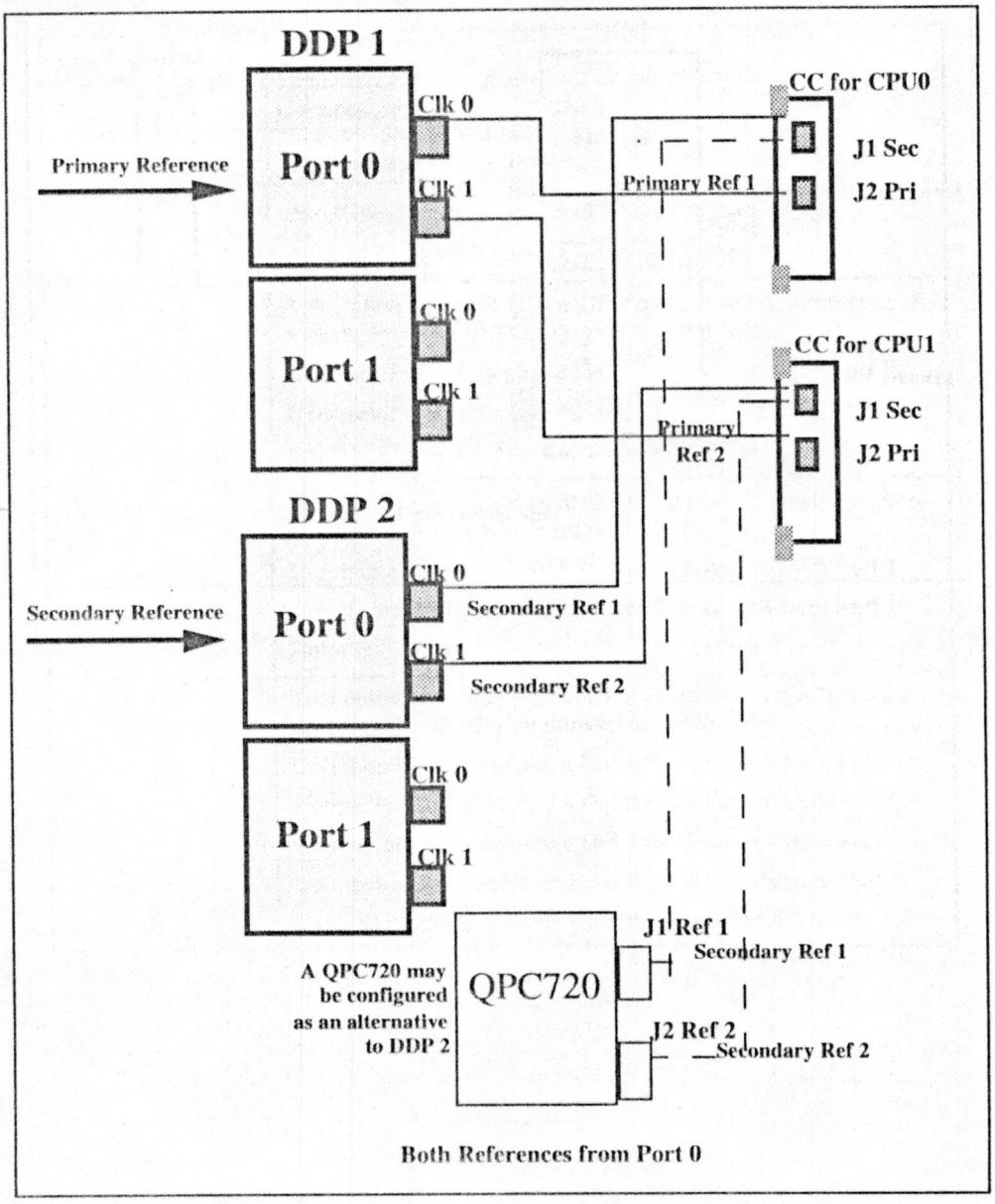


Figure 8 - Clock Controller - Option 3

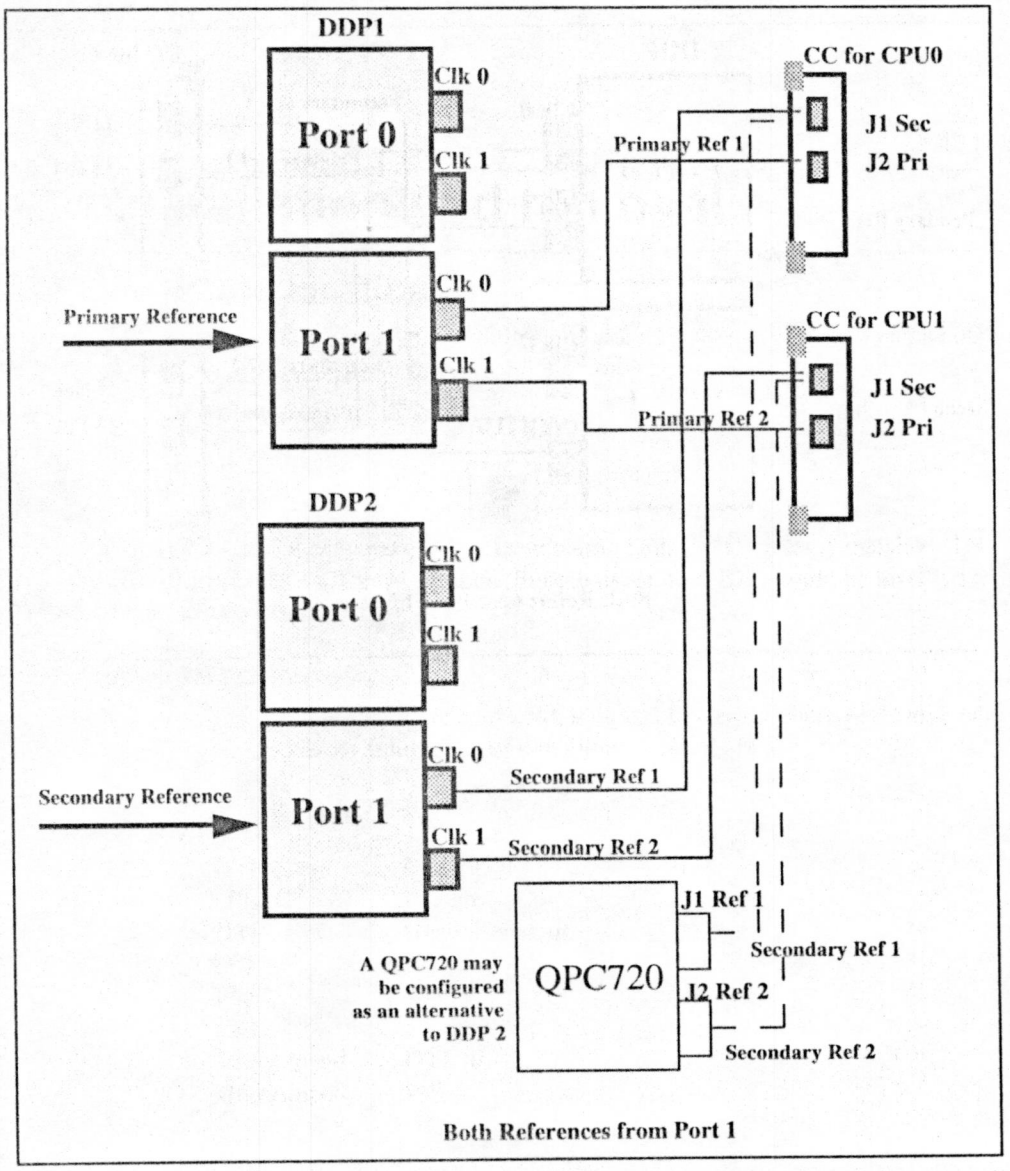
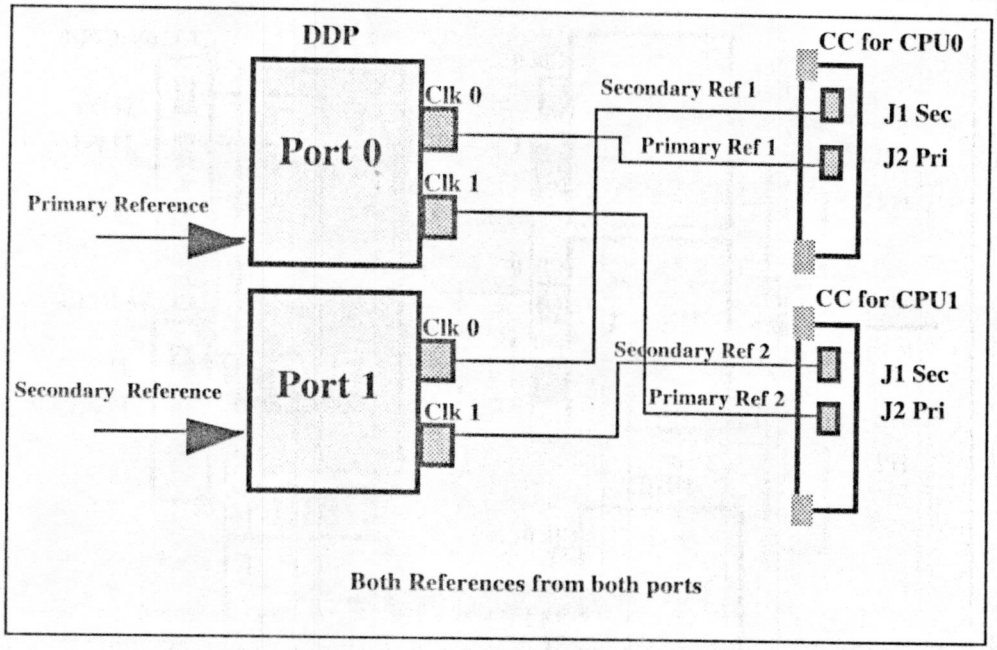


Figure 9 - Clock Controller - Option 4



DDP installation and removal

DDP circuit card locations

Each DDP circuit card requires one slot on a shelf. DDP cards can be placed in any card slot in the network bus, subject to the cautionary note below.

CAUTION

Some installed-based systems may have a Bus Terminating Unit (BTU) already installed. This may interfere with a selected DDP card location. In such cases, the DDP should be installed in an alternate network bus card slot location.

Port definitions

Since the DDP card is dual-card, it equips two ports; these ports may be defined in the following combinations:

Port 0	Port 1
DTI	DTI or
DTI	PRI or
DTI	Unequipped or
PRI	PRI or
PRI	DTI or
PRI	Unequipped
Unequipped	DTI or
Unequipped	PRI

Replacement of a digital trunk (QPC720/QPC472) by a DDP card

The following discussion describes possible scenarios when replacing a digital trunk QPC720 PRI card or QPC472 DTI card configuration with a NT5D12 DDP card configuration.

Case 1 - The two ports of a QPC414 network card are connected to two digital trunks.

In this case, the QPC414 and the two digital trunks are replaced by a single DDP card, which is plugged into the CE shelf in the QPC414 slot.

Case 2 - One port of the QPC414 card is connected to a digital trunk, and the second is connected to a peripheral buffer. Both cards are in network loop location.

In this case, the QPC414 should not be removed. The digital trunk is removed and the DDP card is plugged into one of the two empty slots.

Case 3 - The CE shelf is full, one port of a QPC414 network card is connected to a digital trunk, and the second is connected to a peripheral buffer. This arrangement is repeated for another QPC414. The digital trunks are located in a shelf that provides only power.

In this case, the peripheral buffers will have to be re-assigned, so that each pair of buffers will use both ports of the same QPC414 card. The other QPC414 card may then be replaced by the NT5D12 DDP.

Note in all cases - If a QPC720 card is being replaced by a DDP card, the D-Channel Handler or MSDL may be either reconnected to the DDP card, or removed if an onboard NTBK51AA DDCH card is used.

DDP switch settings

The DDP card is equipped with 6x2 sets of DIP switches for trunk parameters settings for port0 and port1 respectively. Additionally, the DDP card is equipped with one set of four DIP switches for the Ring Ground setting and one set of eight DIP switches for the D-Channel Handler parameters setting.

The DIP switches are used for setting of default values of certain parameters. The general purpose switches are read by the firmware which sets the default values accordingly.

The following parameters are being set by the DIP switches. Factory setups are shown in bold.

General Purpose Switches

A per trunk set of four DIP switches provides the default setting for operational modes. Switch set S9 is used for Trunk 0. Switch set S15 is used for Trunk 1.

Table 9- General purpose switch settings

Switch	Description	S9/S15 Switch Setting
1	Framing Mode	**OFF - ESF** ON - SF
2	Yellow Alarm Method	**OFF - FDL** ON - Digit2
3	Zero Code Suppression Mode	**OFF - B8ZS** ON - AMI
4	Unused	**OFF**

Trunk interface switches

Transmission Mode

A per trunk switch provides selection for T1 transmission.

Table 10- Trunk interface transmission mode switch settings

Description	S4/S10 Switch Setting
For future use.	OFF
T1	ON

Line Build Out

A per trunk set of three switches provides selection between 0, 7.5 or 15 dB values.

Table 11- Trunk interface line build out switch settings

Description	Switch Setting		
	S5/S11	S6/S12	S7/S13
0 dB	OFF	OFF	OFF
7.5 dB	ON	ON	OFF
15 dB	ON	OFF	ON

Receiver Impedance

A per trunk set of four DIP switches provides selection between 75, 100 or 120 Ω values.

Table 12 - Trunk interface receiver impedance switch settings

Description	S8/S14 Switch Setting			
75 Ω	OFF	OFF	ON	OFF
100 Ω	**ON**	**OFF**	**OFF**	**ON**
120 Ω	OFF	OFF	OFF	ON

Ring ground switches

A set of four DIP switches selects which Ring lines are connected to ground.

Table 13- Ring ground switch settings

Switch	Description	S2 Switch Setting
1	Trunk 0 Transmit	**OFF - Ring line is not grounded** ON - Ring line is grounded
2	Trunk 0 Receive	**OFF - Ring line is not grounded** ON - Ring line is grounded
3	Trunk 1 Transmit	**OFF - Ring line is not grounded** ON - Ring line is grounded
4	Trunk 1 Receive	**OFF - Ring line is not grounded** ON - Ring line is grounded

DCH mode and address select switches

A set of eight DIP switches selects between an on-board NTBK51AA D-Channel daughterboard and an external MSDL/DCHI card. In case of an on-board NTBK51AA D-Channel daughterboard, four of the switches provide the daughterboard address.

Table 14 - DCH mode and address select switch settings

Switch	Description	S3 Switch Setting
1-4	D-Channel daughterboard Address	See Table 15
5-7	For future use.	OFF
8	External DCH or Onboard DDCH	**OFF - MSDL or DCHI card** ON - Onboard DDCH daughterboard

Table 15- NTBK51AA daughterboard address select switch settings

Device Address[1]	Switch Setting			
0[2]	OFF	OFF	OFF	OFF
1	**ON**	**OFF**	**OFF**	**OFF**
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Note 1: The maximum number of DCHI, MSDL, and DDCH devices in the system is 16.

The Device Addresses are equivalent to the MSDL DNUM designations. For programming information on the MSDL, refer to NTPs 553-3001-195 and 553-3001-400.

Note 2: Device address 0 is commonly assigned to the System Monitor.

Figure 10 - Switches Functional Areas

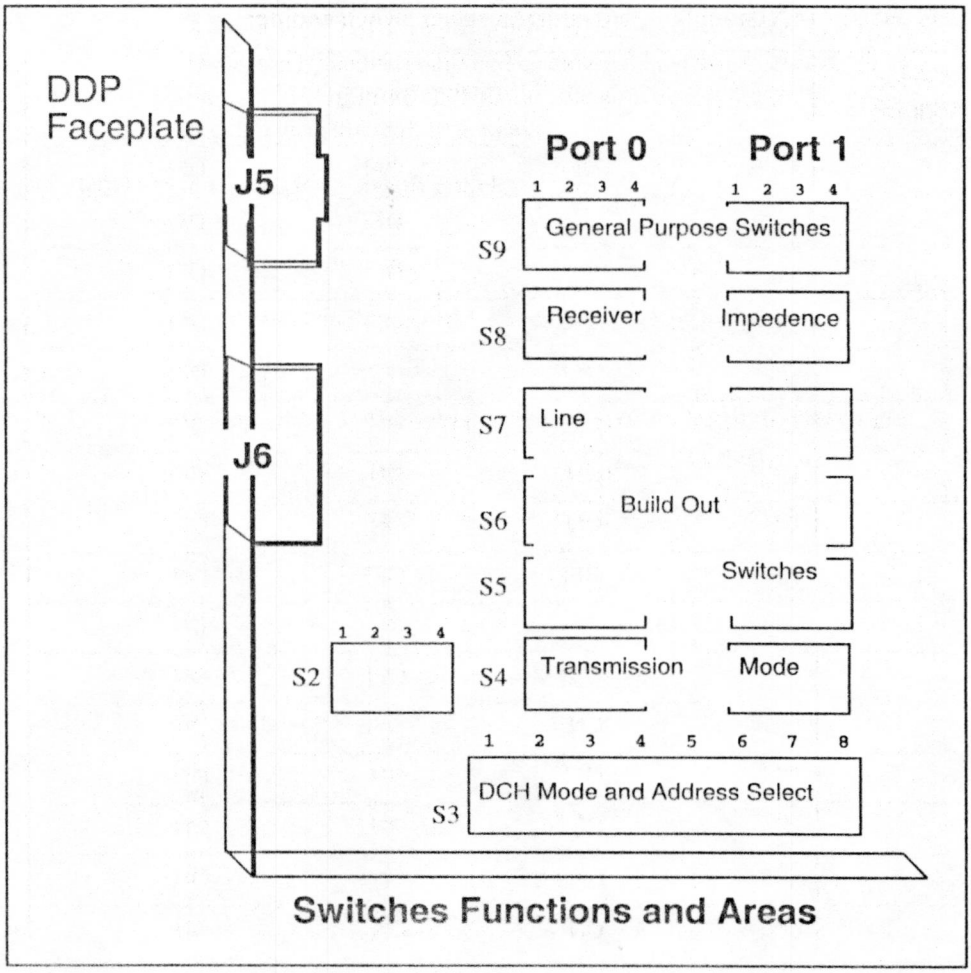
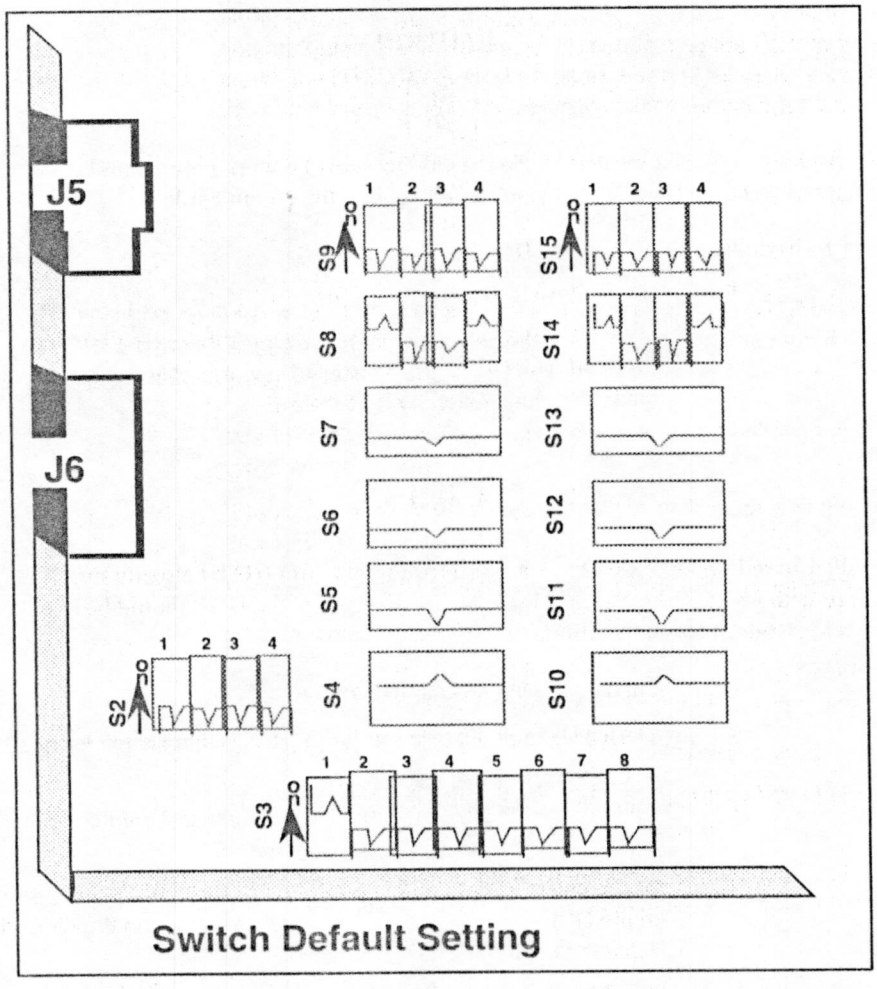


Figure 11 - Switch Default Settings



Installing the NT5D12 DDP

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 1 - Installing the NT5D12 DDP

Step	Action
1	Determine the cabinet and shelf location where the DDP is to be installed. The DDP can be installed in any card slot in the Network bus, subject to the cautionary note below.

CAUTION

Some installed-based systems may have a Bus Terminating Unit (BTU) already installed. This may interfere with a selected DDP card location. In such cases, the DDP should be installed in an alternate network bus card slot location.

2	Unpack and inspect circuit cards and cables.
3	If DDCH is to be installed, refer to "DDCH installation for all systems" on page 57.
4	Set the option switches on the DDP circuit card before installation. Refer to "DDP switch settings" on page 45. S1 (faceplate switch) must be OFF (DIS) when installing the DDP. S1 on the DDP corresponds to the faceplate switch on the QPC414 Network card.
5	Install DDP circuit card in the assigned shelf and slot.
6	Add related office administration data into the system memory. Refer to the work order and the ISDN PRI Description and Administration NTP(553-2901-100).
7	If required, install the I/O adapters in the I/O panel.

8 Run and connect the DDP cables

Note: Refer to "Cabling requirements" on page 20 for cable lengths and attributes. For example, when connecting the DDP to the I/O panel, the NT5D16AA must be used. For a Monitor Jack connection, this cable is equipped with a bantam plug connector for each trunk port.)

CAUTION

Clock Controller cables connecting the Clock Controller and DDP card must **NOT** be routed through the center of the cabinet past the power harness. Instead they should be routed around the outside of the equipment shelves.

9 If required, install connecting blocks at MDF or wall mounted cross-connect terminal.

10 If required, designate connecting blocks at MDF or wall mounted cross-connect terminal.

11 If required, install Network Channel Terminating Equipment (NCTE).

12 Enable faceplate switch S1. This is the "Loop Enable" switch.

The faceplate LEDs should go on for 4 seconds then go off and the OOS, DIS and ACT LEDs should go on again and stay on.

IF DDCH is installed, the DCH LED should flash 3 times.

13 Run PRI/DTI Verification Test. Refer to the ISDN PRI Maintenance NTP (553-2901-500).

14 Run PRI status check. Refer to the ISDN PRI Maintenance NTP (553-2901-500) for the PRI verification tests, DDP self-test, PRI status check, and PRI start-up test.

Removing the NT5D12 DDP

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 2 - Removing the NT5D12 DDP

Step	Action
1	Determine the cabinet and shelf location of the DDP card to be removed.
2	Disable Network Loop using Overlay 60. The command is DISL "loop number." The associated DCHI may have to be disabled first. The faceplate switch S1 should not be disabled until both PRI loops are disabled first.
3	If the DDP card is being completely removed, not replaced, remove data from memory. See the ISDN PRI Description and Administration NTP(553-2901-100).
4	Remove cross connections at MDF to wall-mounted cross-connect terminal.
5	Tag and disconnect cables from card.
6	Rearrange Clock Controller cables if required.

CAUTION

Clock Controller cables connecting the Clock Controller and DDP card must **NOT** be routed through the center of the cabinet past the power harness. Instead they should be routed around the outside of the equipment shelves.

7	If the other circuit of a DDP card is in use, **DO NOT** remove the card.
8	Remove the DDP card only if both loops are disabled. Switch S1 (faceplate switch) must be in the OFF (DIS) position before the card is removed.
9	Pack and store the DDP card and circuit card.

Configuring the NT5D12 DDP

After the NT5D12 DDP has been installed, it may be configured using the same procedures as for the standard QPC720 PRI card. Refer to the ISDN PRI Description and Administration (553-2901-100) document.

Consider the following when configuring the NT5D12 DDP card:

— The Meridian 1 software allows four ports to be defined for the NT6D80 MSDL. The DDCH (NTBK51AA) card has only two ports, 0 and 1; therefore, ports 2 and 3 must not be defined when using the NTBK51AA;

— Port 0 of the NTBK51AA can only be defined to work with Loop 0 of the NT5D12 DDP card, and Port 1 of the NTBK51AA can only be defined to work with Loop 1 of the NT5D12. This relationship must be reflected when configuring a new DCH in overlay 17 (in response to the DCHL prompt, enter either 0 or 1 when specifying the loop number used by the DCH);

— You cannot define one of the DDP loops for the NTBK51AA DDCH, and the other loop for for the QPC757 DCHI or the NT6D80 MSDL.

DDCH installation for all systems

Installation note

Before beginning an installation, do the following:

— Consult the Spares Planning Guide (553-3001-153) document and follow the instructions.

— Bring spares of all cables and boards.

— Remember that test procedures require a 24-hour minimum bit error-rate testing before being used. See the ISDN PRI Description and Administration (553-2901-100) document for these test procedures.

— The MSDL/DCHI (if needed) or the DDP cards may be installed first. However, DDP loops must be configured in software before defining DCH links.

Installing the DDCH daughterboard

Installation instructions for the DDCH (NTBK51AA) card are the same for Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

Set the address for the DDCH (see the switch settings section to set the address). If a DDCH is present on a DDP card then an external D-Channel should not be connected to J6. If a DDCH is present the LED "DCH" will light up.

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 3 - Installing the DDCH card

Step	Action
1	The DDCH can be mounted on any DDP card.
2	Unpack and inspect the DDCH daughterboard.
3	The DDCH comes with four stand-offs so that it can be mounted onto the DDP. These are easily pushed into 4 corresponding mounting holes on the DDP.
4	The DDCH is mounted so that it mates correctly with P2 and P3 on the DDP motherboard.

DDCH removal for all systems

Removing the DDCH daughterboard

Removal instructions for the DDCH (NTBK51AA) card are the same for Meridian 1 Options 21/21E, 51/51C, 61/61C, 71, and 81/81C, and Meridian SL-1 STE, RT, XT, and NT systems.

CAUTION

The static discharge bracelet located inside the cabinet must be worn before handling circuit cards. Failure to wear the bracelet can result in damage to the circuit cards.

Procedure 4 - Removing the DDCH card

Step	Action
1	The DDCH can only be removed when it is disabled in software.
2	Both ports of the associated DDP card must be disabled.
3	Disable the faceplate switch on the DDP.
4	Remove the DDP and DDCH.